

Application Serial No. 10/817,221
Amendment dated October 16, 2006
Reply to Office Action dated July 17, 2006

Amendments to the Specification:

Please replace paragraph [0002] with the following amended paragraph:

[0002] The present invention can be used particularly advantageously for the production of a fuel manifold for the direct injection of petrol fuel into a petrol-driven fuel-driven internal combustion engine to which the following description will explicitly refer without going into detail.

Please replace paragraph [0003] with the following amended paragraph:

[0003] In recent years, petrol-driven fuel-driven internal combustion engines, in which the petrol fuel is injected directly into the cylinders, have come to the fore; in these engines, the petrol fuel is supplied under pressure to a petrol fuel manifold connected to a series of injectors (one for each cylinder of the engine), which are actuated cyclically to inject part of the petrol fuel under pressure in the petrol fuel manifold into a respective cylinder.

Please replace paragraph [0004] with the following amended paragraph:

[0004] In known engines with indirect petrol fuel injection, the petrol fuel manifolds are currently made from plastic material (typically moulded technopolymers) and are secured to the intake manifold, which is also generally made from plastic material, by means of a series of screws. Plastic material is easy to process and extremely economic, but does not have good mechanical properties and is not therefore able to bear the relatively high pressures of the petrol fuel used in direct petrol fuel injection with the necessary safety margins.

Please replace paragraph [0005] with the following amended paragraph:

[0005] In order to ensure the necessary mechanical strength, it has been proposed to use petrol fuel manifolds made from steel in known direct petrol fuel injection engines; these petrol fuel manifolds are nevertheless costly because of the number of machining and welding operations to which they have to be subject. It has also been proposed to use petrol fuel manifolds made from cast aluminum by means of gravity die casting; these petrol fuel manifolds are also costly as gravity die casting is a relatively slow production method, requires a large number of machining operations once the component has been removed from the casting mould and imposes minimum component thicknesses of no less than 4-5 mm.

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Please replace paragraph [0007] with the following amended paragraph:

[0007] The present invention therefore relates to a fuel manifold for the direct injection of fuel into an internal combustion engine ~~as set out in claim 1 and, preferably, any one of the subsequent claims dependent directly or indirectly on claim 1 including a head provided with a plurality of cylinders and injectors, each of which is connected to the fuel manifold and adapted to directly inject fuel into the respective cylinder. An air intake manifold is connected to the head in order to supply fresh air to the cylinders. The fuel manifold is formed by a single monolithic body which is made of thixotropic aluminum by means of a pressure die casting process. The manifold includes a supply duct adapted to distribute the fuel under pressure to the injectors and a flange disposed laterally to the supply duct wherein the flange has a plurality of through holes in order to be secured to the head of the engine by respective screws and further comprises a plurality of coupling members, each of which is adapted to bringing a respective cylinder in communication with an intake manifold.~~ The supply duct includes a main cylindrical tubular channel having two opposite open ends one of which is used to supply the fuel under pressure and the other is closed by a screw cap. In the vicinity of the end closed by the screw cap the main cylindrical tubular channel has a first opening adapted to receive a pressure regulator and a second opening adapted to receive a pressure sensor.

Please replace paragraph [0009] with the following amended paragraph:

[0009] Fig. 1 is a diagrammatic view of an internal combustion engine with direct ~~petrol~~ fuel injection provided with a fuel manifold in accordance with the present invention;

Please replace paragraph [0014] with the following amended paragraph:

[0014] A low pressure pump (not shown in detail) supplies the ~~petrol~~ fuel from a tank (not shown in detail) to a high pressure pump 10 which in turn supplies the ~~petrol~~ fuel to a ~~petrol~~ fuel manifold 11; a series of injectors 12 (one for each cylinder 3) is connected to the ~~petrol~~ fuel manifold 11, each of these injectors 12 being actuated cyclically to inject part of the ~~petrol~~ fuel under pressure in the ~~petrol~~ fuel manifold 11 into the respective cylinder 3. The pressure value of the ~~petrol~~ fuel in the ~~petrol~~ fuel manifold 11 is maintained instant by instant at a desired value by means of a pressure regulator 13 which is coupled to the ~~petrol~~ fuel

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manifold 11 and is adapted to discharge any surplus petrol fuel to a recycling duct which returns this surplus petrol fuel upstream of the low pressure pump (not shown). A sensor 14, adapted to measure the pressure value of the petrol fuel in the petrol fuel manifold 11, is also connected to the petrol fuel manifold 11.

Please replace paragraph [0015] with the following amended paragraph:

[0015] As shown in Figs. 2 to 4, the fuel manifold 11 is formed by a single monolithic body 15 which is made from thixotropic aluminum by means of a pressure die casting process and comprises a supply duct 16, which is of substantially cylindrical shape, has a central axis of symmetry 17 and is adapted to distribute the petrol fuel under pressure to the injectors 12, and a flange 18 disposed laterally to the supply duct 16. The flange 18 has a plurality of through holes 19 so that it can be secured by respective screws 20 to the head 2 of the engine 1 and comprises four coupling members 21, each of which is adapted to bring a respective cylinder 3 into communication with the intake manifold 4.

Please replace paragraph [0018] with the following amended paragraph:

[0018] As shown in Fig. 4, the supply duct 16 is formed by a main cylindrical tubular channel 28 from which a series of further secondary cylindrical tubular channels 29, disposed perpendicularly with respect to the main cylindrical tubular channel 28, leads; each secondary cylindrical tubular channel 29 is adapted to house a respective injector 12 in a leak-tight manner. The main cylindrical tubular channel 28 has two opposite open ends 30 and 31, the end 30 being connected to the high pressure pump 10 in order to supply the petrol fuel under pressure to the petrol fuel manifold 11, while the end 31 is closed by a relative screw cap 32. The function of the end 31 is to enable the correct production of the main cylindrical tubular channel 28 during the pressure die casting process for the monolithic body 15. In the vicinity of the end 31, the main cylindrical tubular channel 28 has an opening 33 adapted to receive the pressure regulator 13 and an opening 34 adapted to receive the pressure sensor 14. Preferably, the openings 33 and 34 are not formed during the pressure die casting process for the monolithic body 15, but are produced subsequently by drilling of the monolithic body 15.